



2000W Electric Chainsaw

Motor

- The Titan chainsaw has a 240V DC carbon brushed motor which provides a power output of 2000W.
- With the chainsaw being mains powered it allowed to designers to choose a high-powered motor. The higher the power of the chainsaw the more effective it is at cutting.

Housing

- The motor of the chainsaw sticks out the side of the casing, so it has its own housing.
- The designer has added ventilation slots allowing the motors fan to consistently cool itself.

Handle Grip

- The handle for the chainsaw extends out of the left of the chainsaw counteracting the weight of the motor sticking out the side.
- It is rounded allowing the chainsaw to be used at multiple angles with different grips.

Chain Brake Function

Chain Break Lever

- The Chain Break has a steel insert which strengthens the part and protecting the user's hand from any sharp objects.

Chain Break Tensioner

- A small spring and containing plate keeps the lever under some tension allowing an inertia activation.

System Overview

Once the user has plugged the Chainsaw into the wall socket, engaged the chain brake and holds the safety lock down the user can press the trigger causing the chain the spin. The Chainsaw turns the outlets AC current into DC for the DC motor which transfers the electrical energy into kinetic energy driving the chain. There are some energy losses such as heat due to friction of the chain and motor. Some energy is also lost through sound as the DC motor creates a 108Db sound when active.

Gear Break

- The Chainsaw possess a spring-loaded gear brake. It is designed to contact with the helix spring on the main shaft/gear stopping the chainsaw physically.

Lubricant Tank

- The Lubricant tank is large and translucent allows the user to see the level through the tank wall.

Gear

- 42 toothed gear slows the motors gear speed down allowing the chain to be spun at 14.5 m/sec.

Tensioning components

- To ensure the system stays in place there is a spring/spacer/circlip tensioning setup.

Front Guard

- A metallic toothed plate on the front of the chainsaw is placed to catch onto the material.

Casing

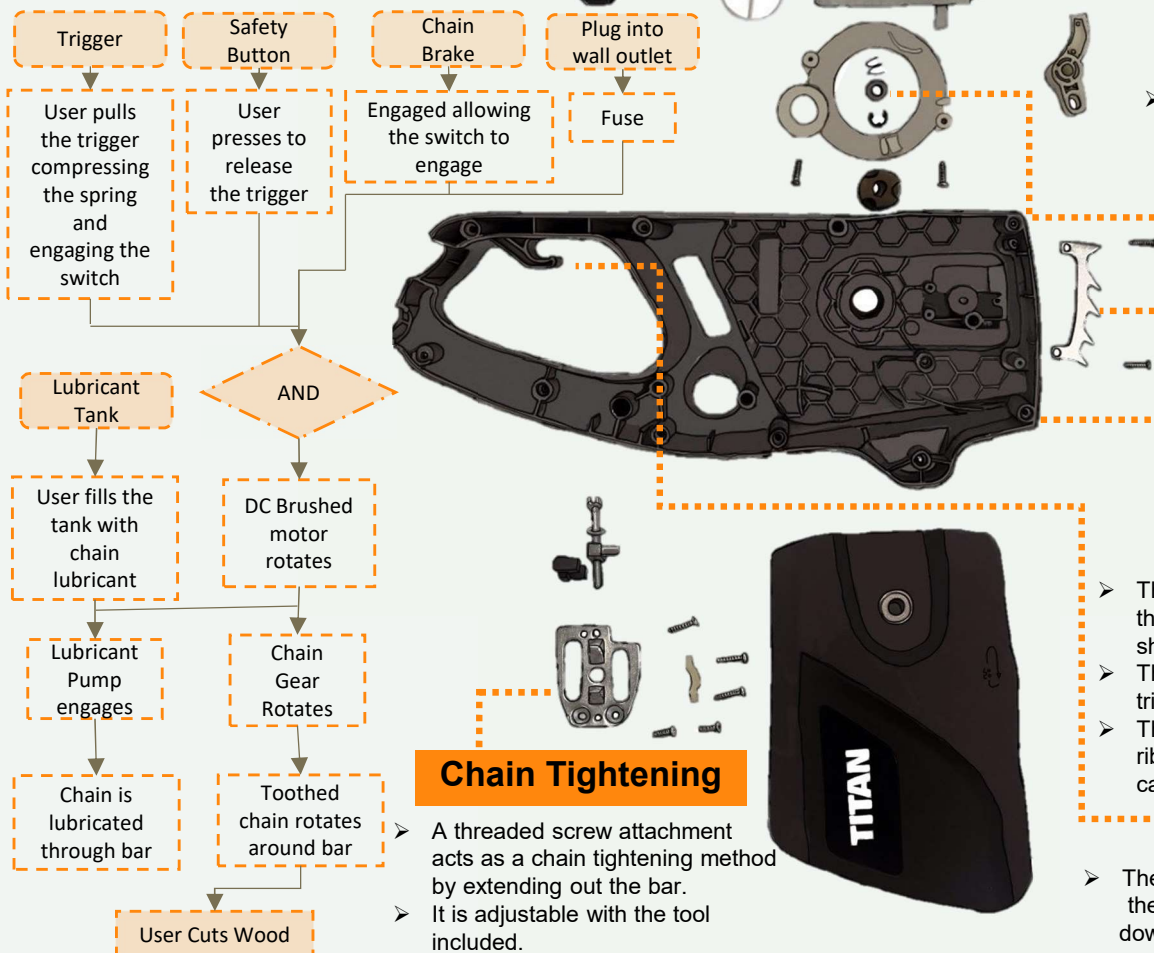
- The casing has many fixings to protect the components from any wood shavings/Dust/Water.
- The casing has guidelines to direct the trigger mechanism and the chain brake.
- The designer has added a honeycomb rib to increase the strength of the casing.

Cable Relief

- The designer added a cable relief tab to the casing to prevent the cable wearing down over time and becoming a hazard.

Chain Tightening

- A threaded screw attachment acts as a chain tightening method by extending out the bar.
- It is adjustable with the tool included.





Chain Brake Dive

- The Chain Brake is a key safety feature on the all chainsaws. It protects the user in 3 different ways; A hand Guard, Moving protection and a kickback brake.

The Lever

- The lever has a thick metal rod through the top. This has 2 functions; the first being to protect the users' hand from being stabbed by tree branches. The second being to create a larger moment so that when a kickback occurs the chain brake automatically activates due to inertia.



The Switch

- When the lever is engaged (Braking) the trigger assembly is broken by pulling out the plastic part that contacts the switch.
- The electrical sign to the motor is immediately cut off and cannot be turned back on until the trigger is released and brake disengaged.



The Shaft Brake

- In addition to stopping the electrical signal, the chain brake also physically stops the spinning chain shaft.
- Using a metallic hook to contact a helix spring it brings the shaft to a stop.
- The designer opted for this method to prevent any serious damage to internal components when the brake activates.



Improvements

Motor Relocation

- With the current position of the motor, it sticks out the left-hand side of the chainsaw.
- The designer may have done this to make maintenance easier as it can be removed without disassembling the whole chainsaw.
- However, having it out of the left offsets the centre of gravity making the weight bearing handle being offset and not easily usable by left-handed users.



Under the casing

- Moving the motor under the chainsaw just in front of the trigger centres the weight distribution.
- Embedding it in the casing creating a more complete design like that of the professional STIHL chainsaws.



Other Changes

- A new gear arrangement will be needed such as a spiral bevel gear to translate the rotation to the correct direction.
- In addition to this a new chain lubricant tank would be needed to sit above the motor.



New Handle

- Moving the motor would also allow for a new handle.
- With the weight in the centre of the chainsaw an all-around handle could be added allowing all users to grip the trigger with their dominant hands.

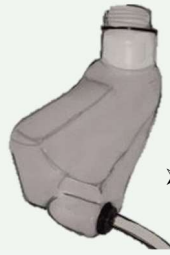


Chain Lubrication System

- The Chain Lubrication system is split up into 3 parts; the reservoir, the pump and the nozzle.

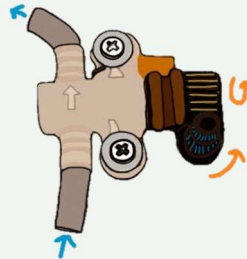
The Reservoir

- The reservoir of the chain lubricant is a plastic Mold designed to fill as much space within the casting as possible without having to sacrifice making the casting larger.
- It is made with a semi-translucent material to allow the user to see how high the fluid is filled.
- The reservoir cap has a cast in icon to help the user identify where to fill it up.
- The reservoir cap also has a long stopped attached to prevent the user from dropping and losing it.



The Pump

- The designer of the chainsaw take advantage of the rotational power from the motor to also drive a small pump.
- Taking the rotation from the main spigot drives a small piston pump which sucks lubricant from the reservoir and pushes it to the nozzle.
- The designer has decided on this feature as it proves the most consistent feed of lubricant while the chainsaw is in use and dispenses none when it is idle.



The Nozzle

- The designer has then added a thin nozzle to deliver the lubricant into the bar.
- Using a rubber seal between the chainsaw and the bar to ensure no waste.
- The nozzle narrows at the end to increase the pressure of the lubricant so it can be passed through the narrow bar and onto the bottom of the chain with ease.

Vibration reduction

The Titan Corded Chainsaw has a vibration value of 6.3m/s^2 compared the professional STIHL chainsaw measuring in at 4.7m/s^2 . The reduction in vibration allows the user to use the chainsaw for longer periods of time and not get tired.

The Solution

- To reduce the vibration experienced by the user I would make two design changes. The first being to add springs between the motor and the handle and casing. Adding two springs in different orientations would allow some of the vibration experienced to be absorbed.
- The second design change would be to add an anti-vibration element. This requires designing a spring mass damper to counteract the natural vibration of the chainsaw while in use. Alternatively using products that are already pre-existing such as a Cellasto anti-vibration element.

